

GC8-Hydro-52, updated on 20 Apr 2024

<https://doi.org/10.5194/egusphere-gc8-hydro-52>

A European vision for hydrological observations and experimentation

© Author(s) 2024. This work is distributed under

the Creative Commons Attribution 4.0 License.



## UAS Hydrometry – Contactless airborne measurements of water level, depth, flow velocity and discharge in rivers and streams

**Peter Bauer-Gottwein**<sup>1</sup>, Daniel Olesen<sup>1</sup>, Karina Nielsen<sup>1</sup>, Alexander Rietz<sup>1</sup>, Monica Coppo Frías<sup>1</sup>, Alexey Dobrovolskiy<sup>2</sup>, Alexey Kadek<sup>2</sup>, Niksa Orlic<sup>3</sup>, Tomislav Grubesa<sup>3</sup>, Tom Hiller<sup>4</sup>, Henrik Grosen<sup>5</sup>, Sune Nielsen<sup>5</sup>, Angelica Tarpanelli<sup>6</sup>, Daniele Giordan<sup>6</sup>, Silvia Barbetta<sup>6</sup>, David Gustafsson<sup>7</sup>, Daniel Wennerberg<sup>7</sup>, Markus Disse<sup>8</sup>, Fabian Merk<sup>8</sup>, Laia Romero<sup>9</sup>, and the UAWOS project team\*

<sup>1</sup>DTU Sustain, Technical University of Denmark, Kgs. Lyngby, Denmark (pbau@dtu.dk)

<sup>2</sup>SPH Engineering, Riga, Latvia

<sup>3</sup>Geolux DOO, Samobor, Croatia

<sup>4</sup>Thurn Group Ltd, Norwich, UK

<sup>5</sup>Drone Systems Aps, Aarhus, Denmark

<sup>6</sup>CNR Research Institute for Geo-Hydrological Protection, Perugia, Italy

<sup>7</sup>SMHI Sveriges Meteorologiska och Hydrologiska Institut, Norrköping, Sweden

<sup>8</sup>Technische Universität München, München, Germany

<sup>9</sup>Lobelia Earth SL, Barcelona, Spain

\*A full list of authors appears at the end of the abstract

High-resolution monitoring of rivers is important because rivers are severely affected by climate change and both frequency and magnitude of extreme events are changing rapidly. Advanced in-situ monitoring technologies need to be combined with satellite Earth Observation (EO) to provide accurate, reliable, and spatio-temporally resolved information for effective decision support, risk assessment, investment analysis for climate change adaptation, and operational forecasting/surveillance.

Traditional hydrometric monitoring of rivers is in-situ and station-based. In-situ monitoring networks lack spatial resolution, have been declining in many regions, and data accessibility is increasingly restricted because of growing conflicts between countries over water resources allocation. To solve this problem, hydrometric monitoring using satellite earth observation needs to be combined with drone-borne hydrometric monitoring technology for validation, deployment in remote and inaccessible regions, and for reliable and accurate estimation of river discharge.

The Horizon Europe UAWOS project develops an Unmanned Airborne Water Observing System to provide key hydrometric variables (bathymetry, velocimetry, water surface elevation) at high spatial resolution/coverage, and data-based products/services to support management and decision making. UAWOS integrates airborne data streams with Copernicus water bodies and water level services for cross validation and to estimate river discharge from satellite EO data.

This contribution outlines the UAWOS work programme and reports first results of airborne

surveys using (i) radar altimetry for water surface elevation mapping, (ii) water penetrating radar and sonar for bathymetric mapping and Doppler radar for surface velocity monitoring. The combination of these datasets for river discharge estimation as well as for validation and enhancement of satellite radar altimetry datasets will be discussed.

**UAWOS project team:** Peter Bauer-Gottwein<sup>1</sup>, Daniel Olesen<sup>1</sup>, Karina Nielsen<sup>1</sup>, Alexander Rietz<sup>1</sup>, Monica Coppo Frías<sup>1</sup>, Alexey Dobrovolskiy<sup>2</sup>, Alexey Kadek<sup>2</sup>, Niksa Orlic<sup>3</sup>, Tomislav Grubesa<sup>3</sup>, Tom Hiller<sup>4</sup>, Henrik Grosen<sup>5</sup>, Sune Nielsen<sup>5</sup>, Angelica Tarpanelli<sup>6</sup>, Silvia Barbetta<sup>6</sup>, Daniele Giordan<sup>6</sup>, David Gustafsson<sup>7</sup>, Daniel Wennerberg<sup>7</sup>, Markus Disse<sup>8</sup>, Fabian Merk<sup>8</sup>, Gabriele Chiogna<sup>8</sup>, Laia Romero<sup>9</sup>, Maria Jose Escorihuela<sup>9</sup>